

## WILLIAM MORGAN AND X-RAYS

By

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In a lecture on "William Morgan, F.R.S., 1750-1833" that he read in December 1931 before the Faculty of Actuaries (*Transactions*, vol. xiv. Part I, No. 126), Sir William Elderton dealt also with Morgan's non-actuarial activities. Among these he referred to (a) Morgan's first paper to the Royal Society in 1785, namely, "Electrical experiments made to ascertain the non-conducting power of a perfect vacuum" (*Phil. Trans.*, lxxxv. p. 272), and (b) his publication in 1781 of an examination of Dr. Crawford's theory of heat and combustion.

Sir William then hazarded the opinion "I do not imagine that either publication would count for much nowadays"; nevertheless ten years later, in 1941, there was published a book entitled *British Scientists*, by Sir Richard Gregory, Bart., F.R.S., emphasizing the importance of the electrical paper, according to which Morgan was apparently the first experimenter with X-rays, 110 years before they were brought in 1895 into prominence by Röntgen. The following is what (p. 38) Sir Richard wrote :—

" British scientists have taken a leading part in the discovery  
 " of the nature and properties of these electrons. Like all  
 " scientific studies, the story began long before the practical  
 " developments of late years. So far back as 1785, William  
 " Morgan, a Fellow of the Royal Society of London, com-  
 " municated to the society a paper in which he described  
 " experiments made by him on phenomena produced by the  
 " passage of electric discharges inside a glass tube. He found  
 " that, when there was no air in the tube and the vacuum was  
 " as perfect as he could make it, no electric discharge could  
 " pass but, upon admitting a very minute quantity of air, the  
 " glass glowed with a green colour. Morgan did not know it,  
 " but he had produced X-rays and his simple apparatus re-  
 " presented the first X-ray tube.

" Sir Humphry Davy continued these studies on the electric

“ discharge in vacuo, and Faraday extended them in a series of remarkable researches. Later, a German professor, W. Hittorf, using an improved vacuum tube, found that the negative electrode, or cathode, gave off rays which caused a fluorescent glow in the glass walls of the tube, and that they travelled in straight lines, so that an object placed in the tube would cast a shadow on the end of the tube opposite the cathode source of the rays. The properties of these cathode rays were investigated independently by Sir William Crookes over a period of ten years from 1878. Hundreds of vacuum tubes had been in use, and X-rays produced by them, before Röntgen, in 1895, observed their effects outside the tubes, which have led to such remarkable applications in medicine and industry.”

A fuller account was given in 1927 by V. E. Pullin and W. J. Wiltshire in their book on “ X-rays, past and present,” in which, after recounting the experiments of Francis Hauksbee, F.R.S., in 1705, and of the Abbé Nollet in Paris in 1753, they proceeded thus :—

“ The next experiments on this question are of great historical interest. They are the work of Mr. William Morgan, to whom must be given the credit of being probably the first experimenter to produce X-rays.” . . . “ There is no doubt that Morgan succeeded in producing what is now often spoken of as a Coolidge vacuum which is, of course, practically a non-conductor.” . . . “ Morgan’s mention of the fact that he was able to judge his vacuum by the colour of the fluorescence is also interesting. It is the first mention of a rough and ready method which is now in general use.”

Two years earlier, on January 19, 1925, Mr. Pullin (then the director of the Radiological Research Department at Woolwich) gave the first of his Cantor lectures, entitled “ Radiological research—a history,” to the Royal Society of Arts. In dealing with Morgan he said, *inter alia*,

“ Morgan’s advance consisted in the fact that on decreasing the gas pressure in his bulb he obtains what he describes as a beautiful green colour, which altered from green to blue and so on to violet and purple as he allowed gas to enter the bulb.”

Pullin and Wiltshire give a picture of Morgan’s apparatus and also pictures of those of Hauksbee and of the Abbé.

It is not after all surprising to learn that William Morgan, who has been described as "possibly the greatest personality ever connected with life assurance," had also other interests, for he had previously qualified at Guy's hospital as a medical man: and his younger brother, the Reverend George Cadogan Morgan, formerly of Jesus College, Oxford, wrote a book in two volumes on electricity and chemistry which was published in 1794.